Chapter 3 FISHERIES CONSERVATION AND MANAGEMENT PLAN

3.1 INTRODUCTION

In the hydro-electric projects, which involve the creation of reservoir and diversion of water to tunnel for power generation, the fish community is one of most affected biotic communities due to habitat alteration in downstream as well as upstream section. The fish in the riverine profile shows spatial and temporal variation depending on water depth, velocity of current, substrate, water discharge, physico-chemical conditions, etc. The conservation of fishes of such areas is a great challenge, because they typically use different habitat along the river stretch for spawning, feeding and shelter.

However, the proposed Rahi Kyoung HE Project involves construction of only trench weir on Rahi Chhu and no water will be stored as reservoir. Therefore, it would not have any adverse impact on aquatic life in Rahi Chhu by way of conversion of lotic ecosystem to lentic ecosystem. However, considering the fisheries composition in Tolung Chhu, Teesta river and Rahi Chhu in the study area some conservation practices was proposed for the development of fisheries in the study area.

The mitigation measures like construction of fish hatcheries, creating the buffer zone along the river, adding diverse substrata, creation of hiding places, pools, and riffles, etc. depend on the size, nature and types of project and local environment. Considering the richness of ichthyo fauna in Tolung Chhu and nature of the project, a Fish Conservation and Management Plan for Rahi Kyoung H.E. Project is discussed below.

3.2 FISH COMPOSITION & STATUS

In the study area, fishing is a seasonal affair, which mainly occurs from March to June and October to December. The commonly used fishing gears in study area are Gill Net, Cast net etc.

During the study, experimental fishing was conducted by using of cast net and Gill net at different stretches from Rahi Chhu, Tolung Chhu and Teesta with the help of local fishermen. No fish landed in the net during the experimental fishing in the study area. However, with the help of published literature and consultation with local a total of 22 species could be confirmed from the Teesta river and Tolung Chhu (**Table 3.1**). However, no fish species were reported from the upper catchment of Rahi Chhu.

Table 3.1: Fish diversity of Study area

S.No.	Order / Family	Name of Species	Local Name	Conservation Status	
				IUCN	NBFGR (2010)
	Cypriniformes				
1	Cobitidae	*Pangio pangia*	Lamo gadela	-	VU
2	Cyprinidae	*Acrossocheilus hexagonolepis*	Catly	-	-
3	Cyprinidae	*Bagarius bagarius latius*	Lohari	-	VU
4	Cyprinidae	*Ctenopharyngodon idellus*	Ghas khane	-	-
5	Cyprinidae	*Cyprinion semiplotum*	Chepti	VU	-
6	Cyprinidae	*Cyprinus carpio*	Carp	VU	-

S.No.	Order / Family	Name of Species	Local Name	Conservation Status	
				IUCN	NBFGR (2010)
7	Cyprinidae	*Garra gotyla gotyla*	Budhna	-	VU
8	Cyprinidae	*Garra gotyla stenorhynchus*	Budhna	-	EN
9	Cyprinidae	*Garra mullya*	Budhna	LC	VU
10	Cyprinidae	*Labeo dyocheilus*	Ther	LC	VU
11	Cyprinidae	*Schizothorax curvifrons*	Asla	-	VU
12	Cyprinidae	*Schizothorax richardsonii*	Asla	VU	VU
13	Cyprinidae	*Tor putitora*	Mahseer, Sahar	EN	EN
14	Nemacheilidae	*Nemacheilus sikkimensis*	Gadela	-	EN
15	Nemacheilidae	*Schistura devdevi*	Gadela	NT	-
16	Nemacheilidae	*Schistura kangjupkhulensis*	Gadela	EN	-
17	Nemacheilidae	*Schistura multifasciata*	Gadela	LC	-
	Siluriformes				
18	Sisoridae	*Bagarius bagarius*	Ganchha maccha	NT	VU
19	Sisoridae	*Glyptothorax gracilis*	Kahray	DD	-
20	Sisoridae	*Glyptothorax sinense*	Kahray	DD	-
21	Sisoridae	*Glyptothorax sinense manipurensis*	Kahray	DD	-
22	Sisoridae	*Glyptothorax sinense sikkimensis*	Kahray	-	-

IUCN: International Union For Conseervation of Nature; NBFGR: National Bureau of Fish Genetic Resources, Lucknow (ICAR).EN: Endangered; NT: Near Threatened: VU= Vulnerable; LC = Least Concern

3.3 IMPACT OF PROPOSED PROJECT

The proposed Rahi Kyoung HE Project involves construction of only trench weir on Rahi Chhu and no water will be stored as reservoir. Therefore, it would not have any adverse impact on aquatic life in Rahi Chhu by way of conversion of lotic ecosystem to lentic ecosystem. It would not impact migration of fishes into this stream from Tolung Chhu. It only the dewatered stretch downstream of weir site up to the tail race discharge point which will have reduced discharge especially during lean season. In order to provide adequate water to downstream users and for the survival of aquatic life in the river, EAC directed to maintain the environmental flow in the scoping clearance as:

"*Environmental flow release would be 20% of average of four consecutive months of 90% dependable year, 25% of average monsoon flow. The flow for remaining months will be in between 20% depending on the site*."

3.4 MITIGATION MEASURES

In order to mitigate the adverse impact of Rahi Kyoung HE project on the aquatic ecology of the area fishes in particular the following measures shall be adopted to protect and preserve existing aquatic life:

- Releasing /ensuring minimum Environment flow in the river
- Development of Fish hatchery

3.4.1 Fishery Development

It is proposed that the river stretches downstream and upstream of the proposed project area be stocked with fingerlings. It is proposed to implement supplementary stocking programme for the project area. The rate of stocking is proposed as 100 fingerlings of about 30 mm size per km. The stocking can be done annually by the Fisheries Department, State Government of Sikkim. To achieve this objective, facilities to produce seed of trout need to be developed at suitable sites.

The fish spawn of selected species can be generated in the sites by establishing the "fish breeding center". The fingerling, thus produced can then very well be released in the Tolung Chhu and Rahi Chhu to maintain the fish diversity in the area. The technical expertise will be made available by the State Fisheries Department, Sikkim.

3.4.2 Environmental Flow

An environmental flow release is necessary to maintain the ecological balance in the downstream of the diversion structure. It depends on the social and environmental needs. In case of Rahi Kyoung HEP annual distribution of ecological release/ environmental flow varies in different season depend on the seasonal discharge of the Rahi Chhu.

MoEF&CC has specified environment flow release in terms of reference as, "*Environmental flow release would be 20% of average of four consecutive months of 90% dependable year, 25% of average monsoon flow. The flow for remaining months will be in between 20% depending on the site specific requirements*".

Environment flow is calculated based on TOR stipulation and same is given at **Table 3.2**.

Table 3.2: Environmental Flow

Season	Percentage of 90% Dependable Year	Ecological Release (Cumec)
Monsoon	25%	2.075
Pre Monsoon and Post Monsoon	20%	0.800
Lean flow period	20%	0.337

3.5 COST ESTIMATES

The cost required for non-recurring expenditure i.e. developing of hatcheries, office complex, etc. shall be Rs. 17.00 lakh. The dimension of the hatching nurseries and rearing unit and their approximate cost is given in **Table 3.3**. The total recurring expenditure for 3 years will be Rs. 16.23 lakh. Thus total cost for fish hatcheries farm will be about **Rs. 33.23 lakh**.

Table 3.3: Estimated cost of setting of hatchery

S. No.	Particulars	Dimensions/ Rate (in Rs.)	Amount (Rs. in lakh)
A.	**Capital – Non-recurring Expenditure**		
1	Construction of Hatchery (Hatchery building , one concrete hall with provision of hatching troughs each with 4 trays) for production of fingerlings fish -1 No.	15mx6mx5m	5.00
2	Nursery ponds -2 No.	5mx2mx1m	3.00
3	Rearing Ponds -2 No.	10mx5mx2m	2.00
4	Stocking Ponds -1 No.	30mx10mx3m	2.00
5	Office Complex, with all infrastructure and separate provision for store and two laboratories and fish feed room etc. -1 No.	8m x6 m	5.00
	Total A		**17.00**
B.	**Recurring Expenditure**		
1	**Salaries (For 3 years)**		
	Farm Manager -1 No.	20000/- per month for three years	7.20

S. No.	Particulars	Dimensions/ Rate (in Rs.)	Amount (Rs. in lakh)
	Farm Attendants-1 Nos.	8000/month for three years	2.88
2	Fish seed (carried over seed with A V. Weight 25 gm each 10,000 nos.)	Lump Sum	0.25
3	Fish food (rice bran oil cake)1:1	Lump Sum	1.00
4	Nursery and Rearing tanks management (Lime, natural fertilizer, wages nursery and etc.)	Lump Sum	3.00
5	Maintenance for 2 years	50000/ year	1.00
6	Contingency & miscellaneous expenditure-3 years	30000/ year	0.90
	Total B		**16.23**
TOTAL A+B			**33.23**